

Battle Green Improvements/Town Center Streetscape Project

Intersections of:

Bedford Street @ Hancock Street / Harrington Road

**Massachusetts Avenue @ Woburn Street /
Winthrop Road / Fletcher Avenue**

**Board of Selectmen Meeting
October 19, 2015**

Discussion Points

I. Bedford Street @ Hancock Street / Harrington Road

- 1) Analysis Results for Improvement Options.

II. Massachusetts Avenue @ Woburn Street/Winthrop Road/Fletcher Street

- 1) Address questions from previous Board meetings



Project Limits



Design Options

1. Remove the Bedford Street right-turn slip lane.
2. Option 1 with traffic signals.
3. Retain the Bedford Street right-turn slip lane with one-way away from Bedford Street.
4. Option 3 with traffic signals.
5. Roundabout.
6. Make Harrington Road one-way away from Bedford Street (southbound). Remove the Bedford Street right-turn slip lane.
7. Make Harrington Road one-way toward Bedford Street (northbound). Two-way STOP control.
8. Make Harrington Road one-way away from Bedford Street (southbound). Retain the Bedford Street right-turn slip lane.
9. Make Harrington Road one-way away from Bedford Street (southbound). Make the Bedford Street right-turn slip lane one-way away from Bedford Street.
10. Make Harrington Road one-way away from Bedford Street (southbound). Make Bedford Street one-way between Massachusetts Avenue and Harrington Road.



Bedford Street / Hancock Street / Harrington Road

Existing Conditions



Morning Peak Hour

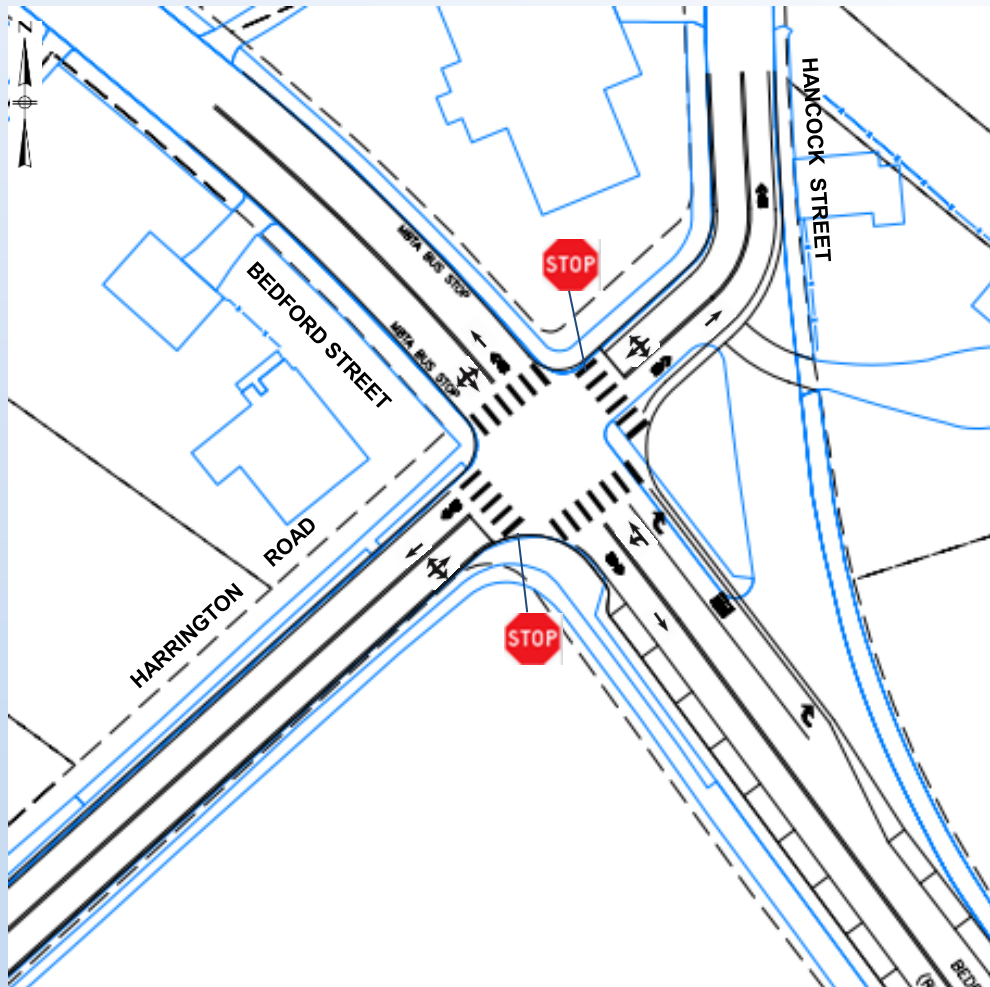
	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	7	50
Bedford Street - SB	21	170
Harrington Road - EB	43	130
Hancock Street - WB	135	1,975

Afternoon Peak Hour

	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	16	800
Bedford Street - SB	171	1,625
Harrington Road - EB	129	1,140
Hancock Street - WB	56	340

Bedford Street / Hancock Street / Harrington Road

Option 1 – Remove Bedford Street Right-Turn Slip Lane



Morning Peak Hour

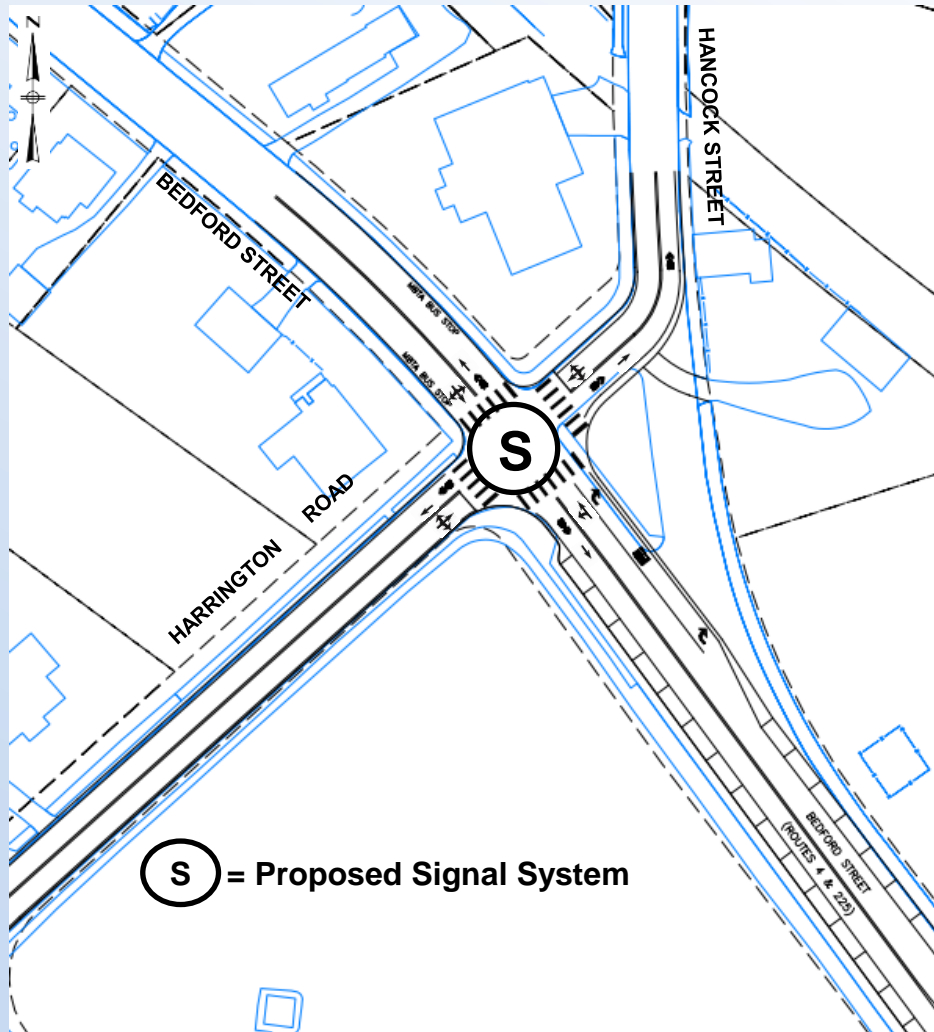
	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	9	40
Bedford Street - SB	20	70
Harrington Road - EB	32	130
Hancock Street - WB	528	2,630

Afternoon Peak Hour

	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	22	1,400
Bedford Street - SB	47	1,000
Harrington Road - EB	49	875
Hancock Street - WB	434	1,880

Bedford Street / Hancock Street / Harrington Road

Option 2 – Option 1 With Traffic Signals



Morning Peak Hour

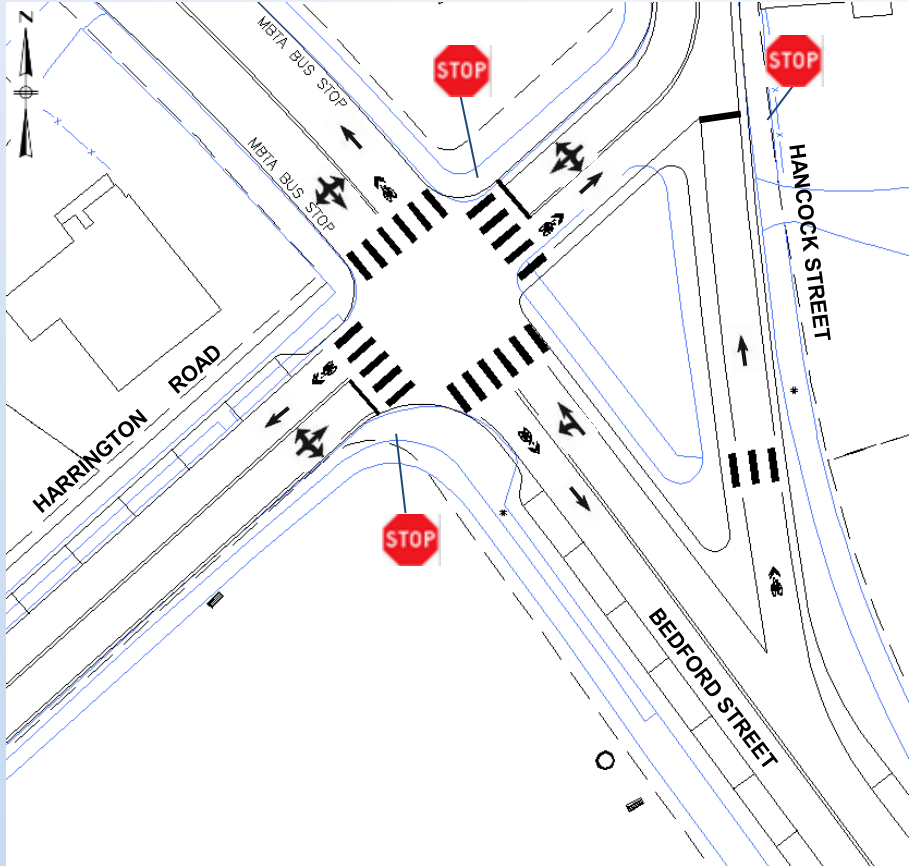
	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	67	1,600
Bedford Street - SB	103	1,360
Harrington Road - EB	18	110
Hancock Street - WB	197	2,800

Afternoon Peak Hour

	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	42	1,325
Bedford Street - SB	148	1,300
Harrington Road - EB	25	180
Hancock Street - WB	348	2,050

Bedford Street / Hancock Street / Harrington Road

Option 3 - Retain the Bedford Street Right-Turn Slip Lane with one-way away from Bedford Street



Morning Peak Hour

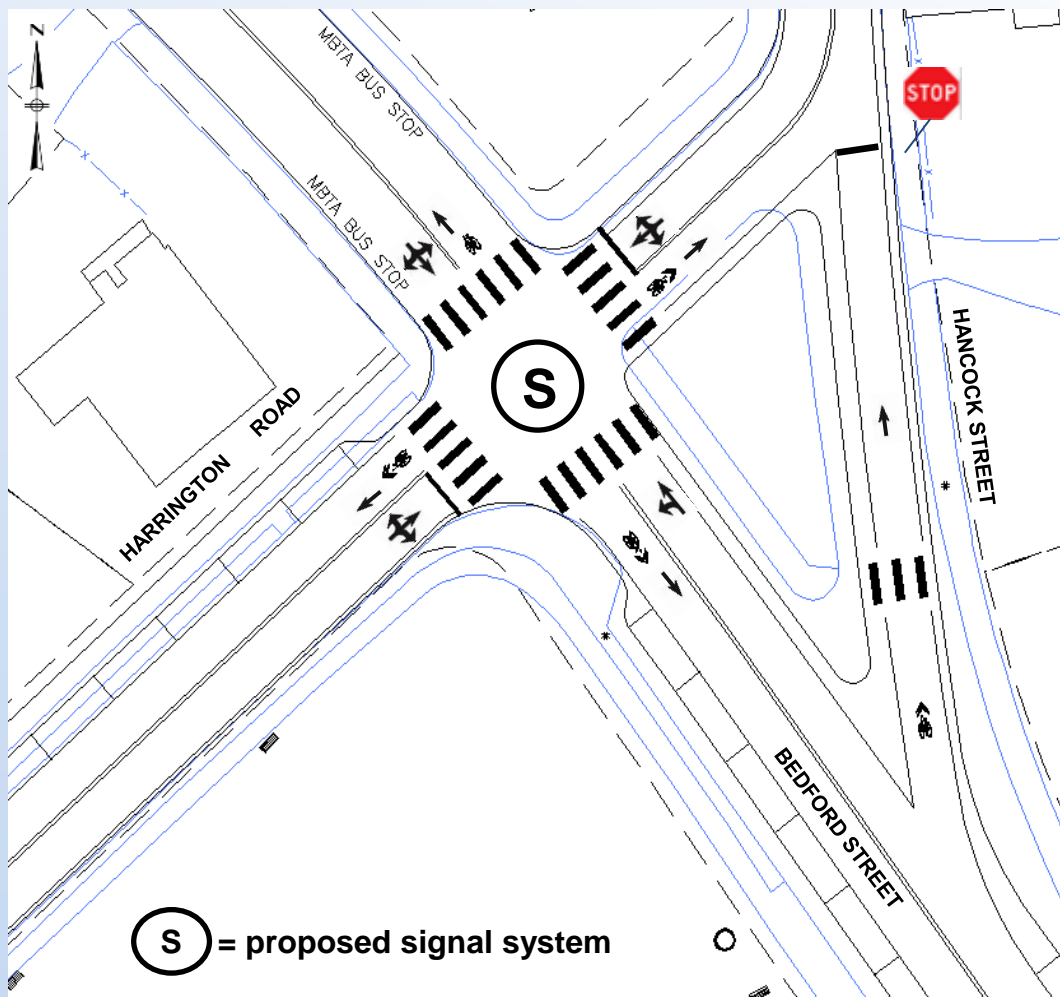
	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	8	20
Bedford Street - SB	18	60
Harrington Road - EB	49	180
Hancock Street - WB	493	2,700

Afternoon Peak Hour

	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	13	875
Bedford Street - SB	142	1,430
Harrington Road - EB	78	1,050
Hancock Street - WB	724	1,890

Bedford Street / Hancock Street / Harrington Road

Option 4 – Option 3 With Traffic Signals



Morning Peak Hour

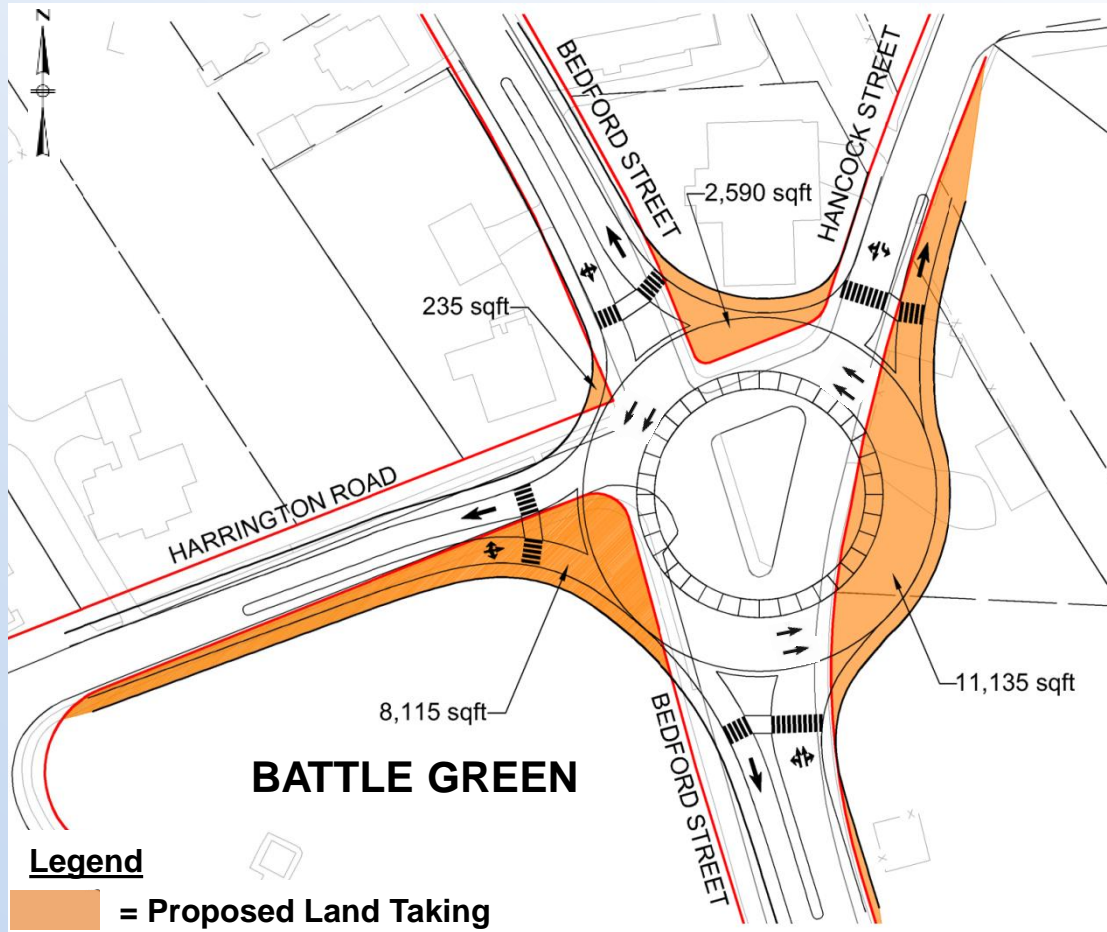
	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	64	1,400
Bedford Street - SB	218	1,500
Harrington Road - EB	18	115
Hancock Street - WB	192	2,930

Afternoon Peak Hour

	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	31	1,390
Bedford Street - SB	254	1,210
Harrington Road - EB	30	250
Hancock Street - WB	289	1,920

Bedford Street / Hancock Street / Harrington Road

Option 5 – Multi-lane Roundabout



Morning Peak Hour

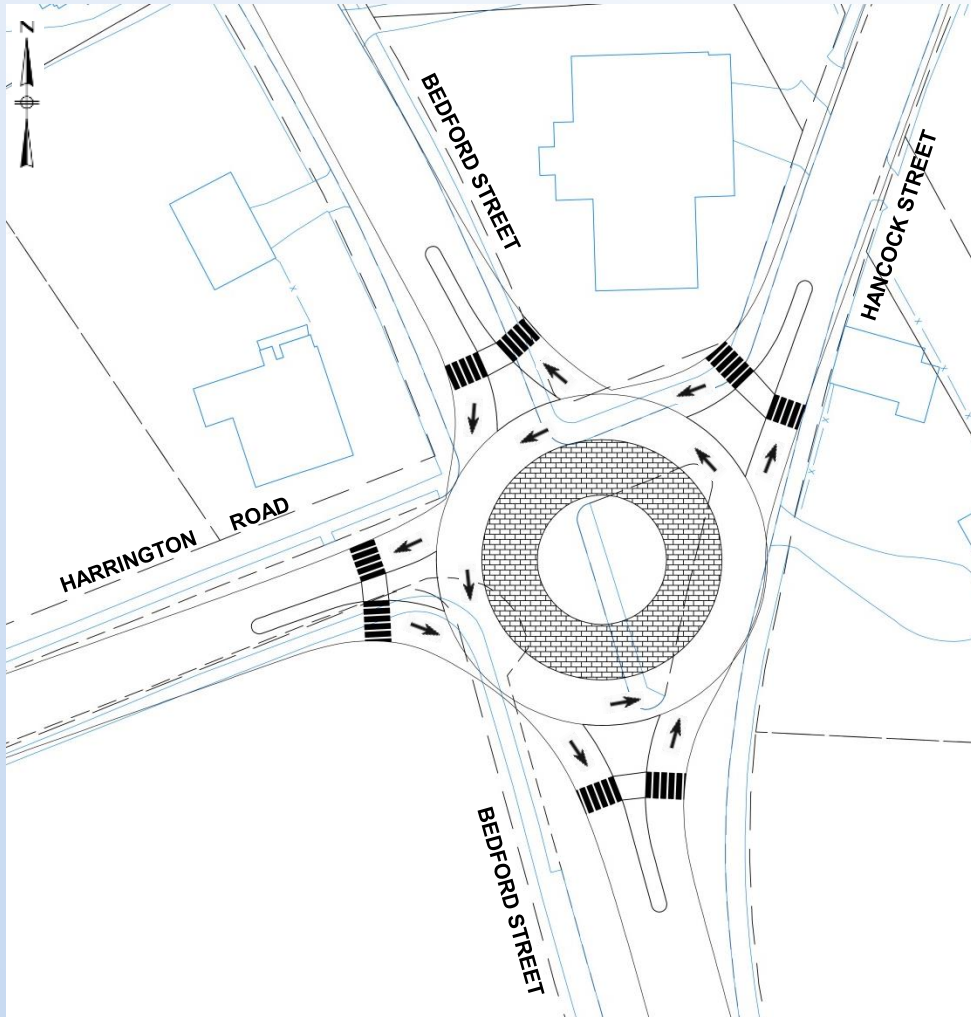
	Average Delay (Seconds)	Queue (feet)
Bedford Street – NB	9	65
Bedford Street – SB	19	90
Harrington Road - EB	12	25
Hancock Street - WB	14	85

Afternoon Peak Hour

	Average Delay (Seconds)	Queue (feet)
Bedford Street – NB	11	80
Bedford Street – SB	15	100
Harrington Road - EB	12	100
Hancock Street - WB	9	30

Bedford Street / Hancock Street / Harrington Road

Option 5A – Single-lane Roundabout



Morning Peak Hour

	Average Delay (Seconds)	Queue (feet)
Bedford Street – NB	14	120
Bedford Street – SB	32	170
Harrington Road - EB	12	25
Hancock Street - WB	73	740

Afternoon Peak Hour

	Average Delay (Seconds)	Queue (feet)
Bedford Street – NB	36	370
Bedford Street – SB	20	166
Harrington Road - EB	14	45
Hancock Street - WB	16	90

Bedford Street / Hancock Street / Harrington Road

Option 6 – Make Harrington Road One-Way From Bedford Street (Southbound)
Remove the Bedford Street right-turn lane



Morning Peak Hour

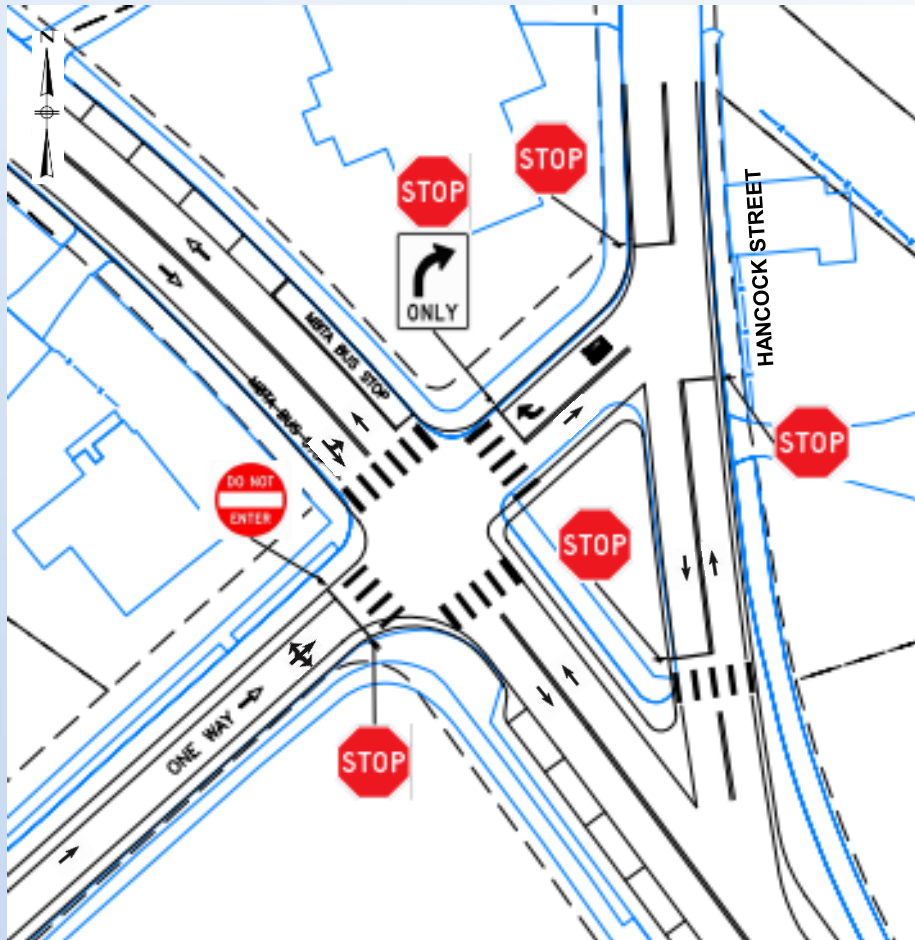
	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	12	1,175
Bedford Street - SB	80	1,460
Harrington Road - EB	N/A	N/A
Hancock Street - WB	1,387	2,690

Afternoon Peak Hour

	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	11	1,425
Bedford Street - SB	190	1,595
Harrington Road - EB	N/A	N/A
Hancock Street - WB	285	1,900

Bedford Street / Hancock Street / Harrington Road

Option 7 – Make Harrington Road One-Way Toward Bedford Street (Northbound)



Morning Peak Hour

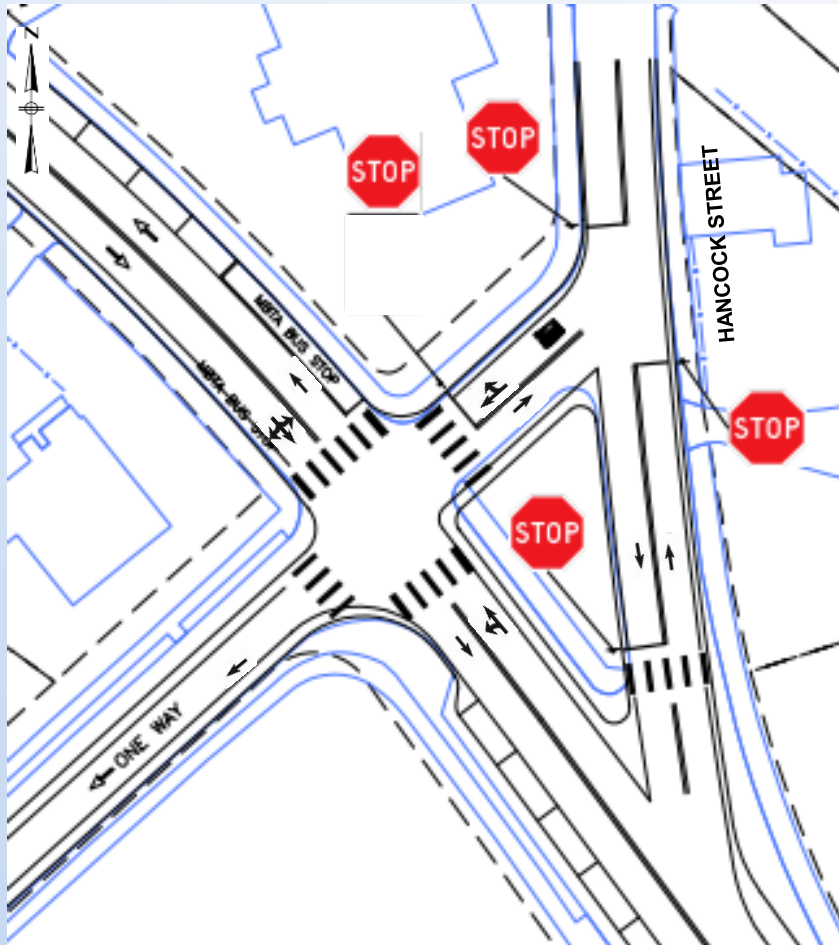
	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	10	25
Bedford Street - SB	21	525
Harrington Road - EB	128	420
Hancock Street - WB	880	2,820

Afternoon Peak Hour

	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	14	263
Bedford Street - SB	204	1,650
Harrington Road - EB	60	850
Hancock Street - WB	587	2,080

Bedford Street / Hancock Street / Harrington Road

Option 8 – Make Harrington Road One-Way From Bedford Street (Southbound)
Retain the Bedford Street right-turn slip lane



Morning Peak Hour

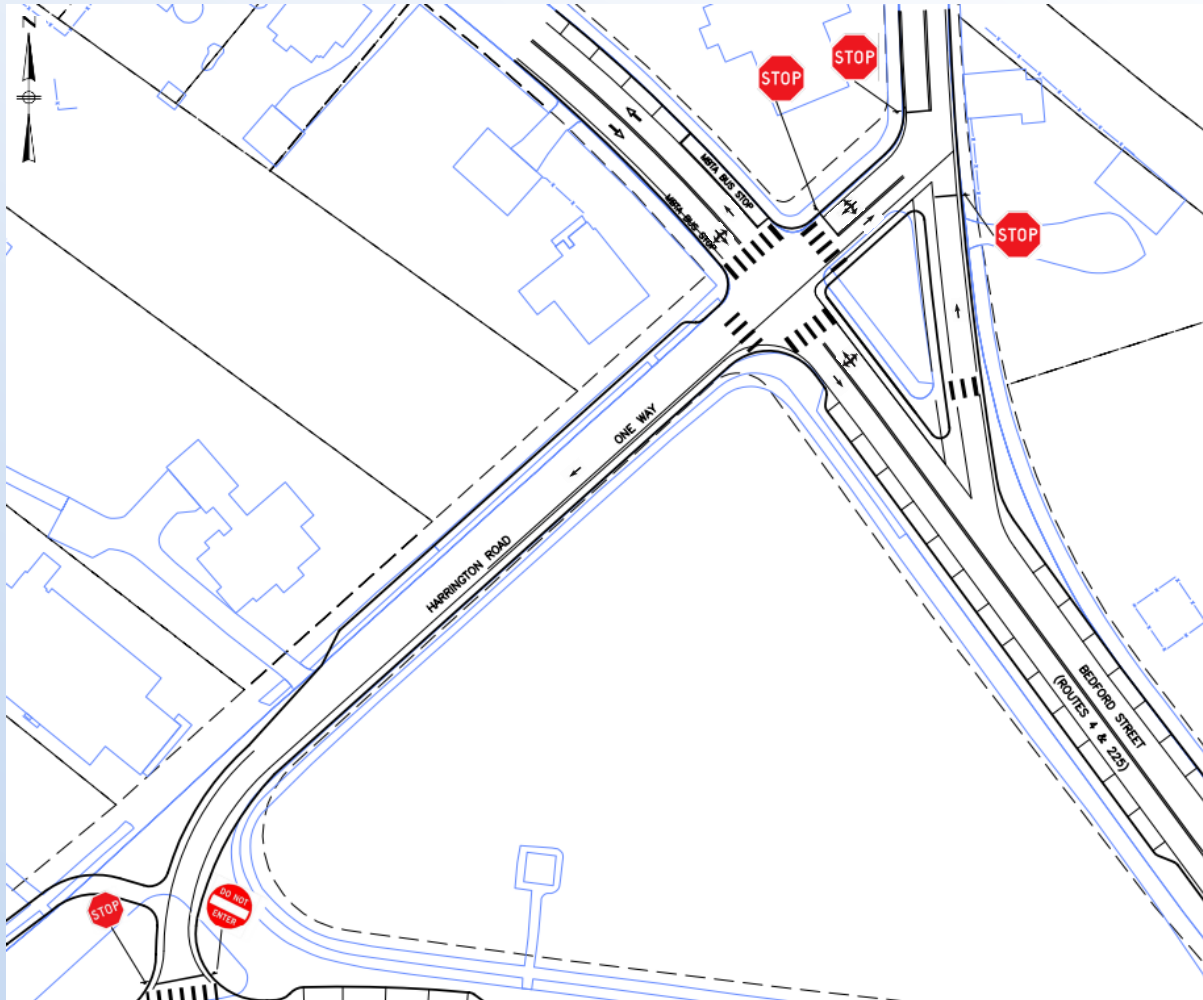
	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	7	40
Bedford Street - SB	37	570
Harrington Road - EB	N/A	N/A
Hancock Street - WB	151	2,075

Afternoon Peak Hour

	Average Delay (Seconds)	95 th % Queue (feet)
Bedford Street - NB	15	660
Bedford Street - SB	142	1,600
Harrington Road - EB	N/A	N/A
Hancock Street - WB	84	1,050

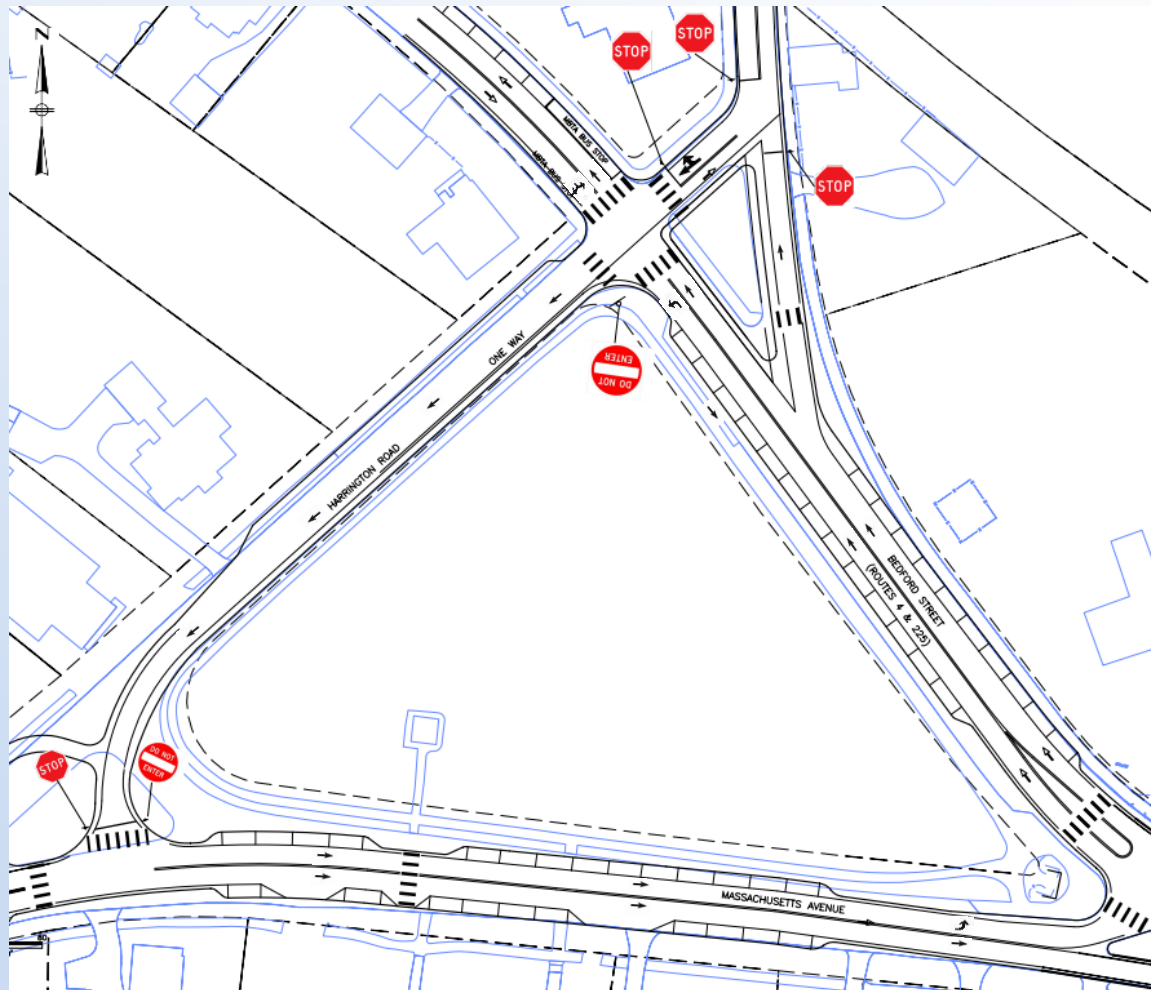
Bedford Street / Hancock Street / Harrington Road

Option 9 – Make Harrington Road One-Way From Bedford Street (Southbound) with Bedford Street right-turn slip lane one-way away from Bedford Street



Bedford Street / Hancock Street / Harrington Road

Option 10 – Make Harrington Road One-Way From Bedford Street (Southbound), Massachusetts Avenue one-way between Harrington Road and Bedford Street & Bedford Street one-way between Massachusetts Avenue and Harrington Road.



Lexington Center Streetscape Project

Questions and Answers

1. In lieu of a traffic signal at Woburn Street, would it be feasible to add pedestrian crossing at locations such as the Police Station, bike path, Muzzey School? Cost ? Visual Impact ? Effectiveness? Also, should turning restrictions (eg. No left turn) be added on Winthrop?

Yes, it is feasible to add pedestrian beacon systems such as the RRFB (Rectangular Rapid Flashing Beacon) at these locations, provided a full signal system is not proposed at the Woburn Street intersection. The cost is approximately \$30K/crosswalk. For visual impact, the flashing Beacons are bright strobe lights. Solar power system is not recommended due to the visual impact. Research indicates that the RRFB is effective.

A Left Turn restriction on Winthrop Road would yield little benefit as the turn volumes are small (5 to 10 vehicles during the peak commuting hours).

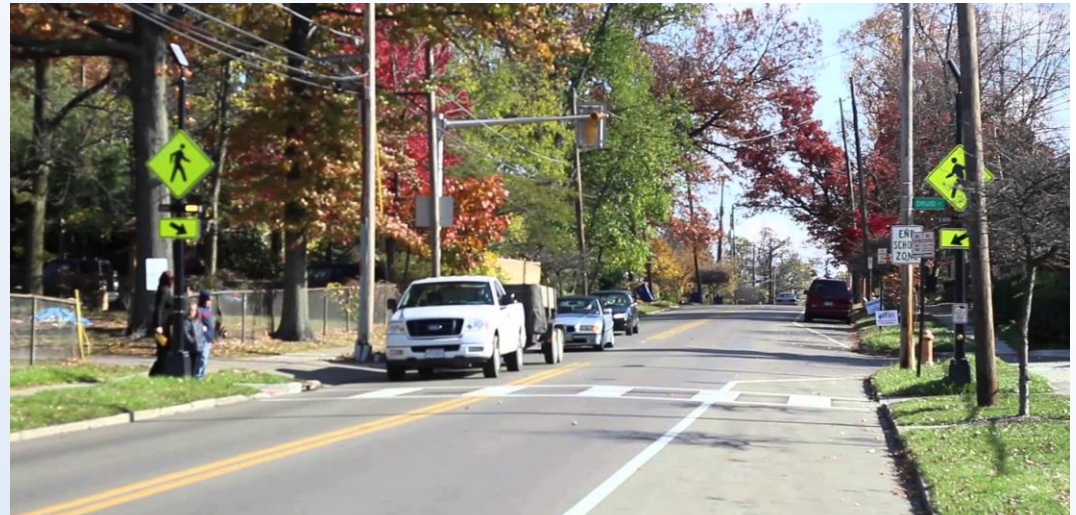
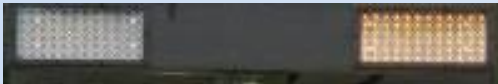
2. Clarify the cost of just the traffic signal vs. the other aspects of the project.

Approximately \$150K to \$200K.

3. What data did BETA use that suggests that a traffic signal is called for?

- Traffic Data (Volumes and Crash) Collected in 2013, 2014 and 2015
- MUTCD Warrants
- Pedestrian and Bicycle Data
- Special Events Observations

Rectangular Rapid Flashing Beacons (RRFB)



Lexington Center Streetscape Project

Questions and Answers

4. What is the projected cost of the entire streetscape project?

Approximately \$8 million.

5. We are using 2008-2010 data for this study. Can DPW provide/use more current data?

Current available data was expanded to 2013.

6. Are we examining the neighborhood impact and potential for cut thru traffic?

Yes, additional data were collected in 2014 and another consultant was hired to evaluate the potential impact.

7. Can we do a low cost test of: No left turn out of Winthrop?

Yes, however, a Left Turn restriction on Winthrop Road would yield little benefit as the turn volumes are small (5 to 10 vehicles during the peak commuting hours).

8. Can we test a no right turn lane on Mass Ave at Waltham St. to see the impact on eastbound traffic?

Yes, the test would consist of coning off the existing right-turn lane, counting traffic and observing the queuing on Mass Ave eastbound. The traffic signal head display and timing would be adjusted too.

Lexington Center Streetscape Project

Questions and Answers

9. Can the Battle Green portion of this study be brought up to the same level of design as the rest of the project?

The Battle Green Project can be advanced and direction on the Harrington Road/Bedford Street intersection will help these efforts. If it is the desire of the Board to advance the Battle Green Project to the level of the Center Streetscape Project, we can hold the Center project and work toward advancement of the Battle Green Project until it reaches the 25% design level.

10. If a round-about is installed at Woburn, how close would it be to the Russell Square condos? Approximately 20 feet. The current offset ranges between 45' and 75'

11. Can the Town lower the speed limit in the Center to 20-25 mph and also add speed monitoring signs? Would like a tutorial on establishing speed limits and what the 85th percentile means.

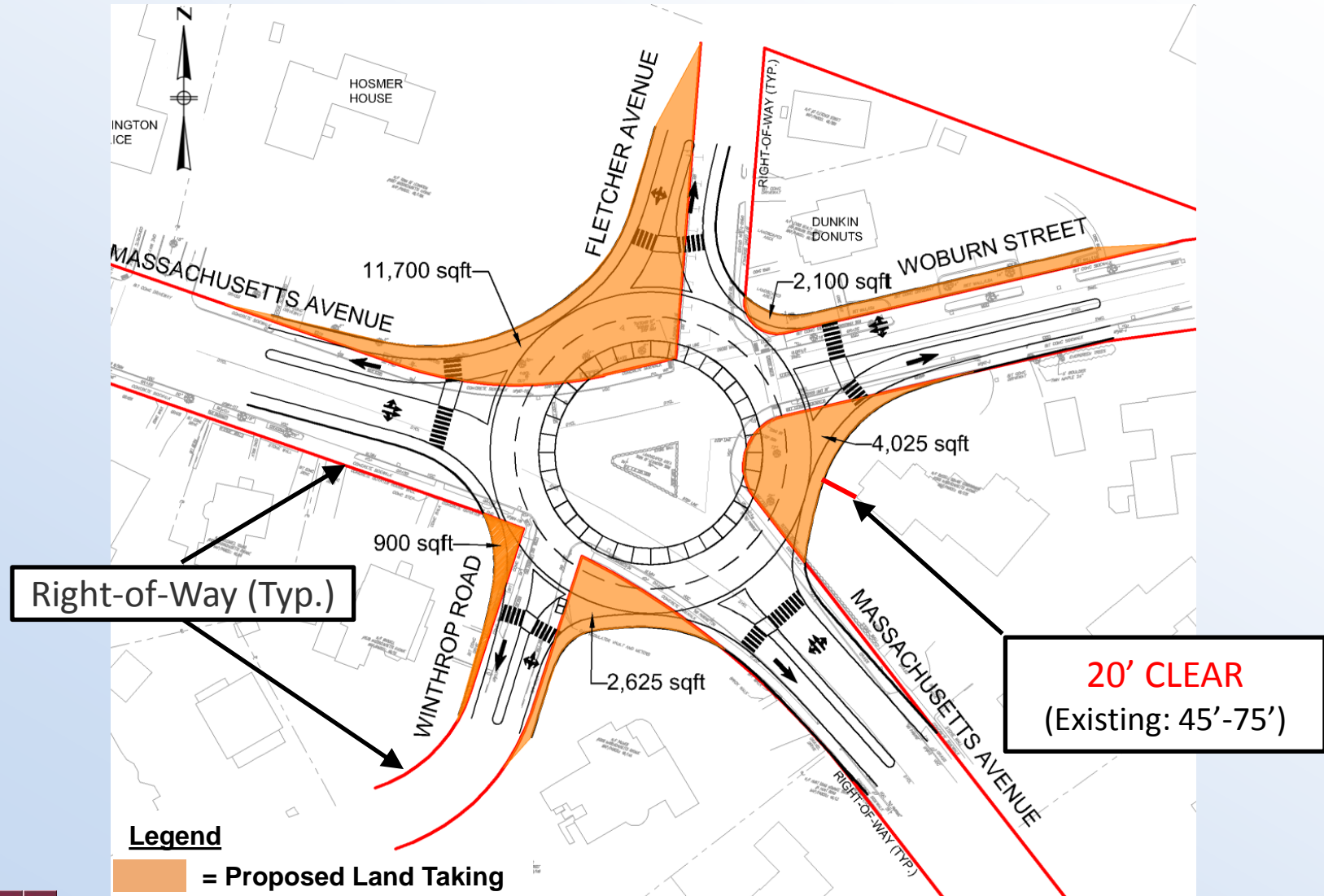
All regulatory speed limits are under MassDOT jurisdiction. Regulatory speed limits are established based on a speed study and the 85th percentile speed. The 85th percentile speed is the speed at or below which 85% of all vehicles are observed to travel under free flowing conditions.

12. How do the engineers decide where to locate crosswalks in the Center?

Crosswalks are located based on the ability to provide a safe crossing and pedestrian desire lines. A pedestrian desire line is a path that represents pedestrian's desired route between an origin point and a destination point. A good example is the crosswalk located on Mass Ave at Meriam Street.

Massachusetts Avenue / Woburn Street / Winthrop Road

Option 6 - Intersection With Roundabout



Existing Crosswalk Location



Lexington Center Streetscape Project

Questions and Answers

13. Is it possible to get a waiver on the speed limit setting requirements?

No ! The Town is liable for any non-conformance design regulations.

14. Can we move the MBTA bus stop at Winthrop to closer to the Baptist church?

MBTA bus stop locations are under the MBTA jurisdiction. Bus stop locations are based on ridership demand at the desire location and the spacing between stops. The locations shown in the plan were derived based on meetings with users.

15. Should we put the utilities underground as part of this project? What would be the cost?

The estimated cost for undergrounding the 11 poles from Lexx Restaurant to the Woburn Street intersection (1,000 ft) is approximately \$2 million.

16. What does prep for signals without the actual final install entail? Can this be done with the proposed geometry?

The traffic signal underground electrical conduits and cable pull boxes can be installed with the proposed geometry. The remaining traffic signal equipment could be installed at a later date. The proposed geometry without a traffic signal would create significant delays and queues on Woburn Street. A graphic display of the impact is shown in an upcoming slide.

Lexington Center Streetscape Project

Questions and Answers

17. Have we looked at the types of accident data (ie. Rear end vs side swipe, etc...)

Yes! A detailed analysis of accident data was performed.

18. What is the wait time versus the queue under the different scenarios ?

A summary of the delay times and queue lengths is provided on the next two slides.

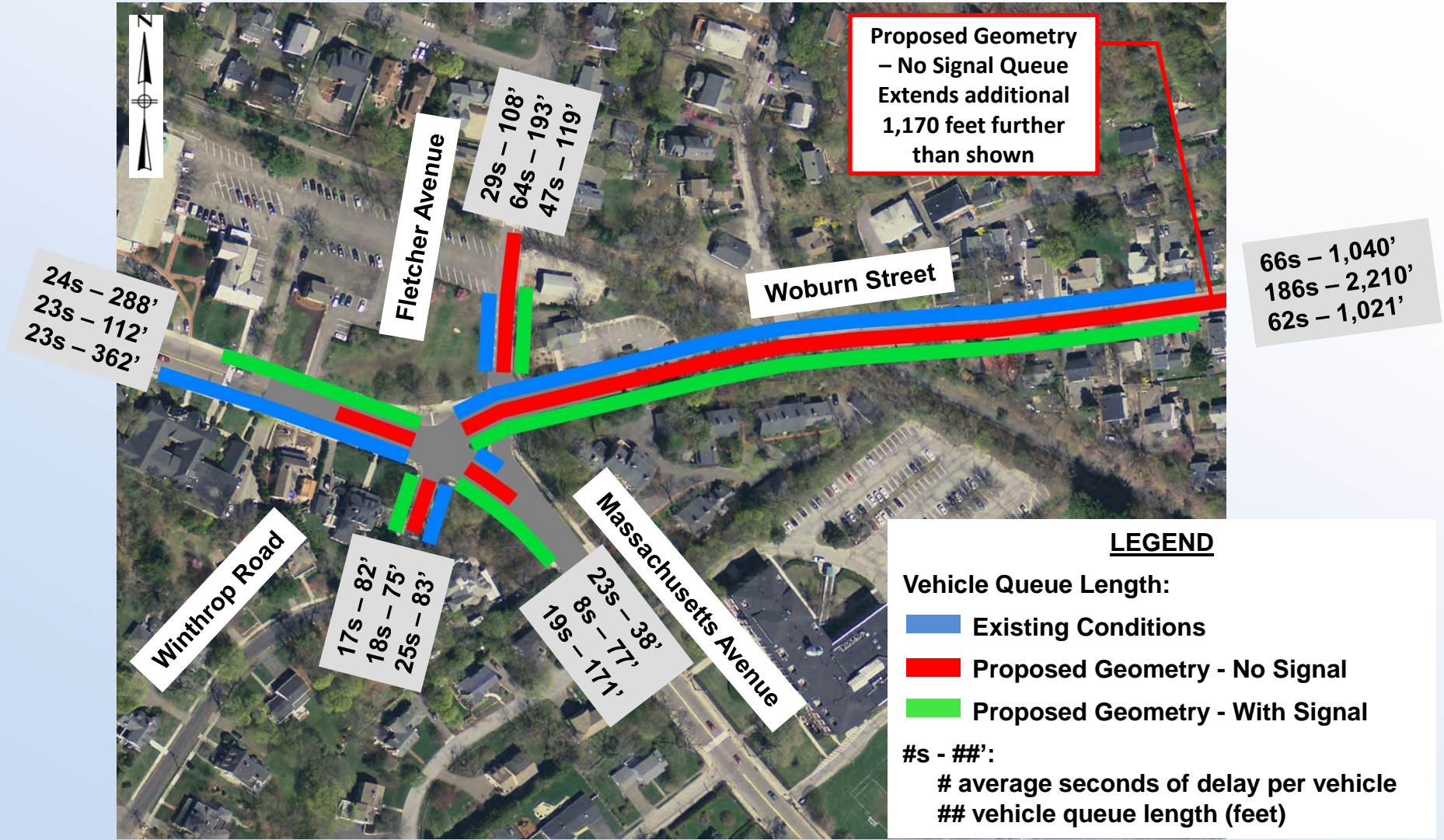
19. Has a CO reduction calculation been done for the signals? If not, can it be done ?

No, a CO analysis was not performed. CO can be calculated. The estimated cost to complete a CO analysis is approximate \$10K. The CO reduction could be minimal based on the traffic analysis results between the existing and proposed signal conditions.



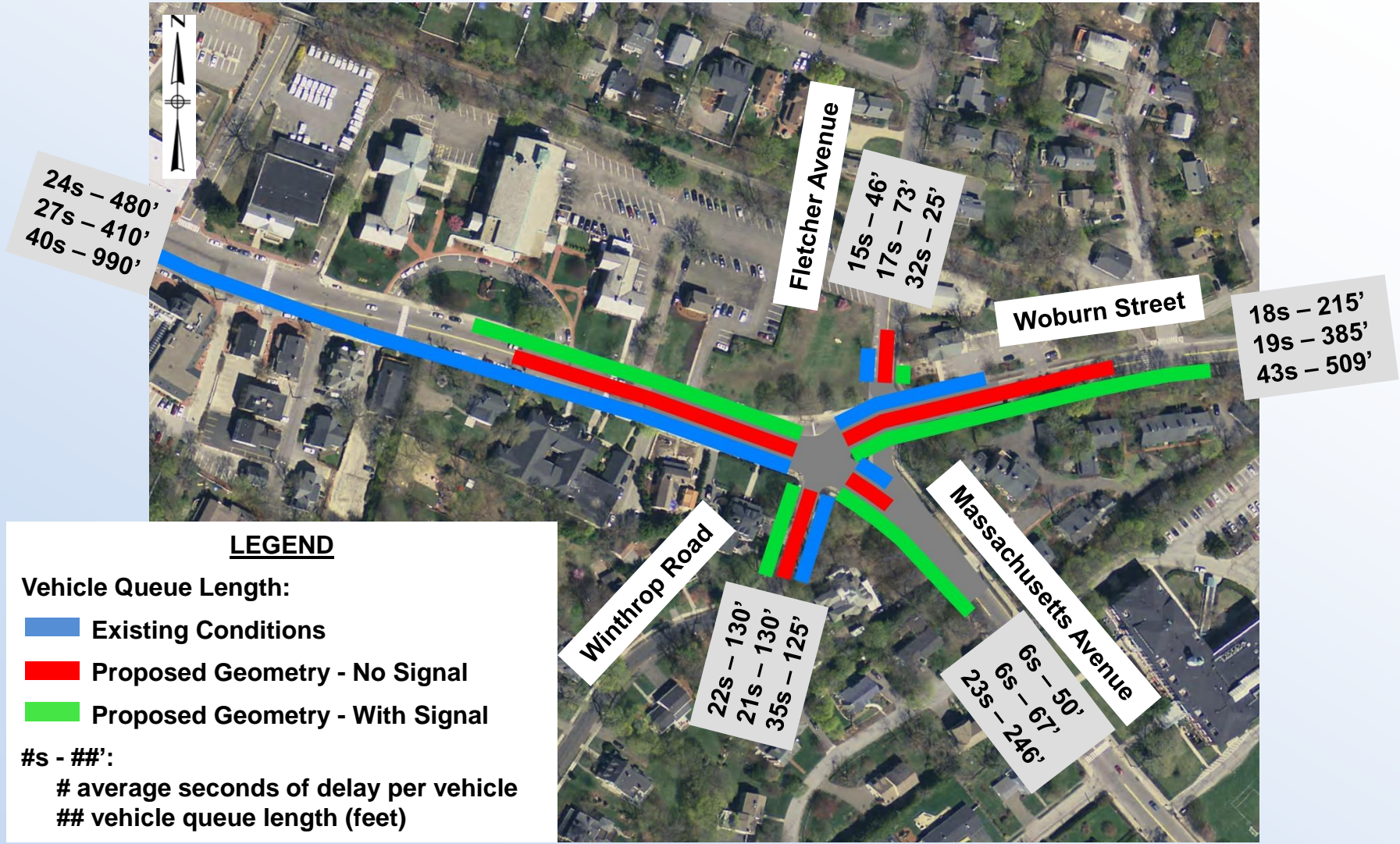
Massachusetts Avenue / Woburn Street/Winthrop Road/Fletcher Avenue

Delay Times and Vehicle Queues – AM Peak Hour



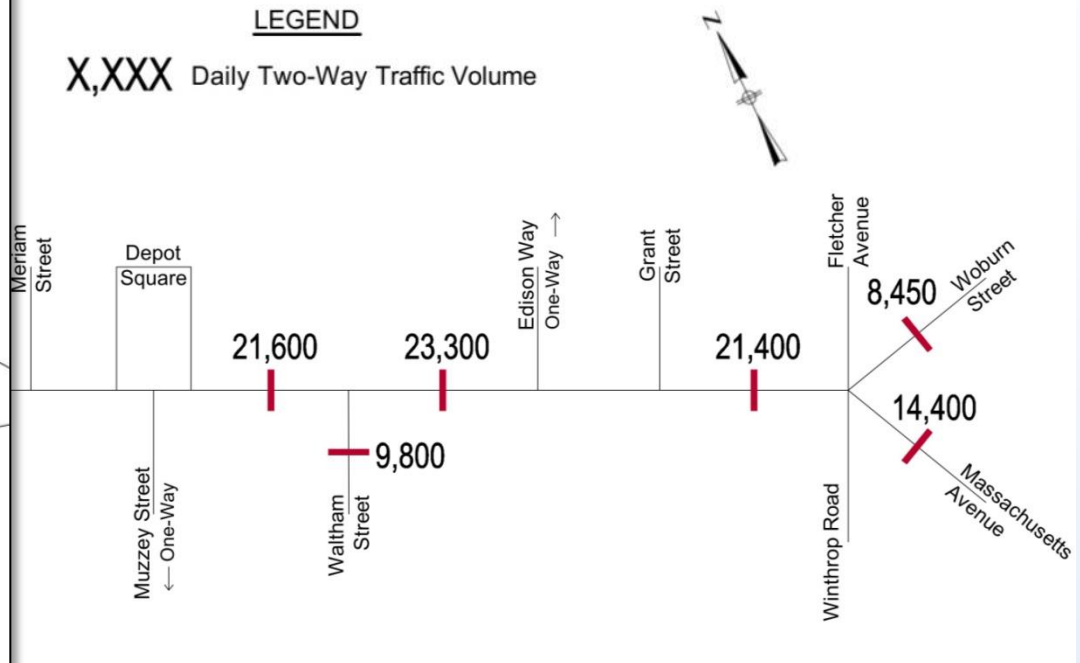
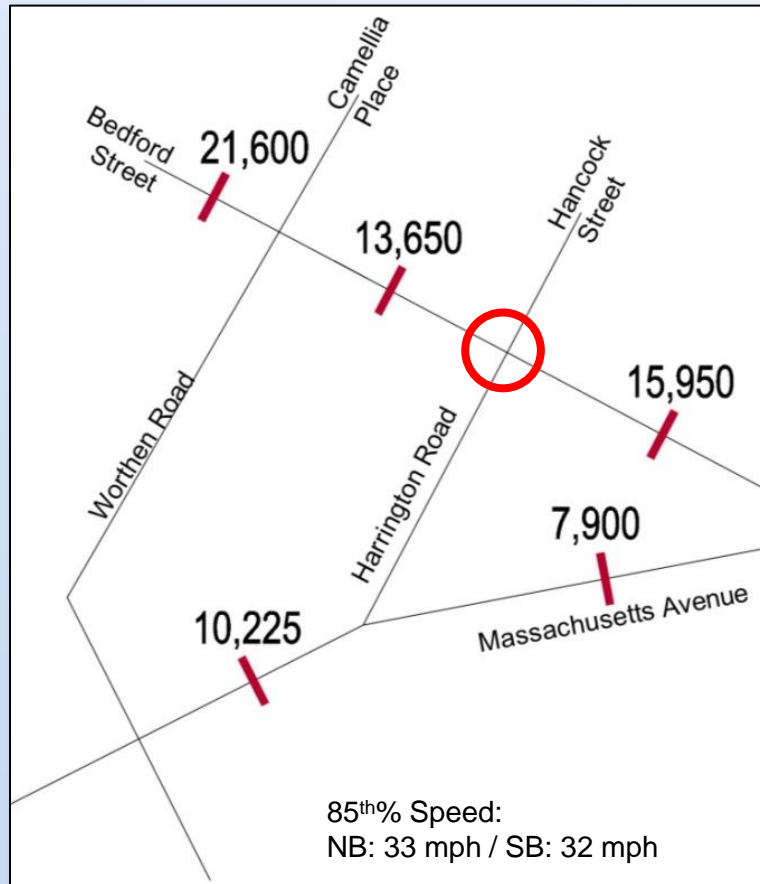
Massachusetts Avenue / Woburn Street/Winthrop Road/Fletcher Avenue

Delay Times and Vehicle Queues – PM Peak Hour

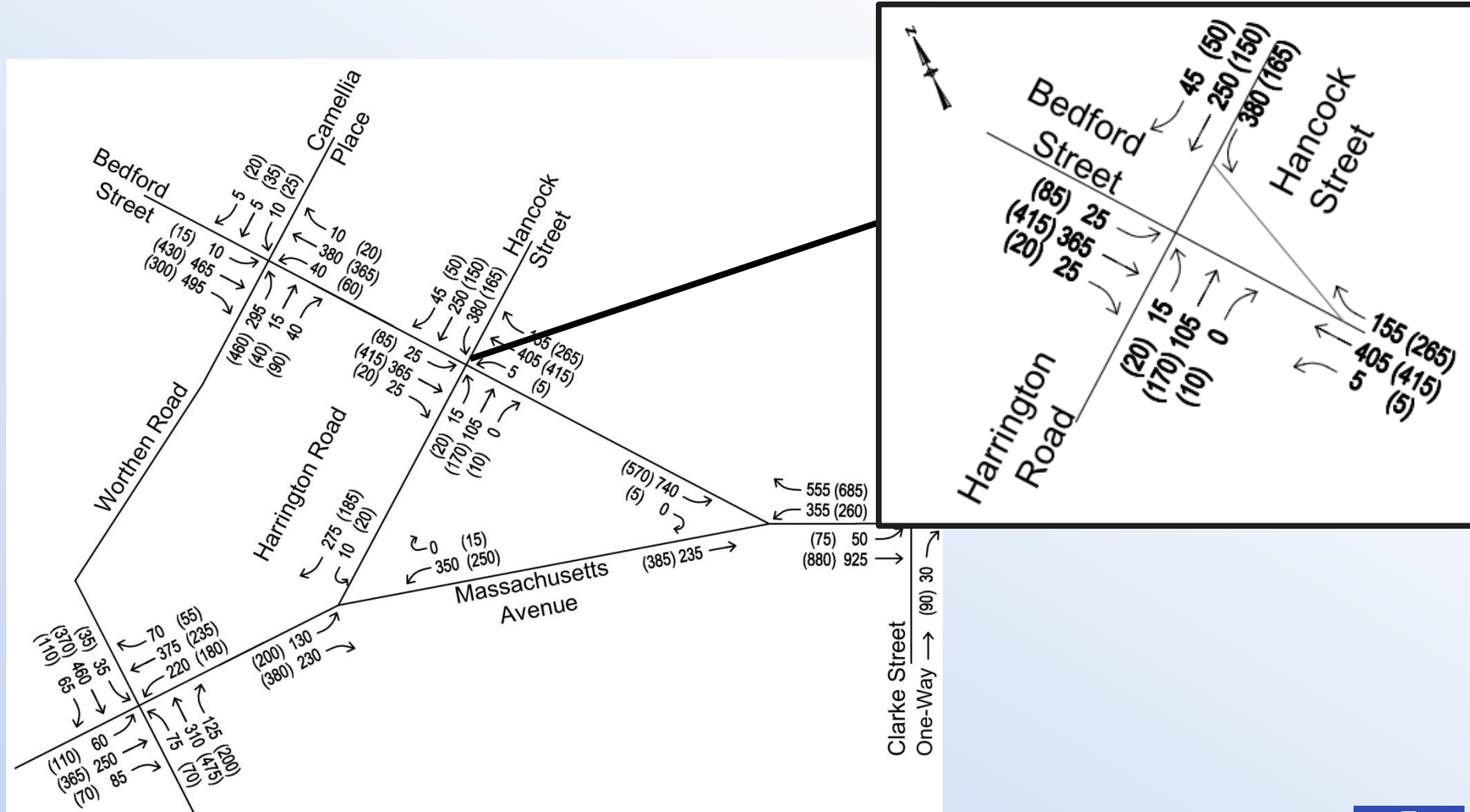


Thank You!

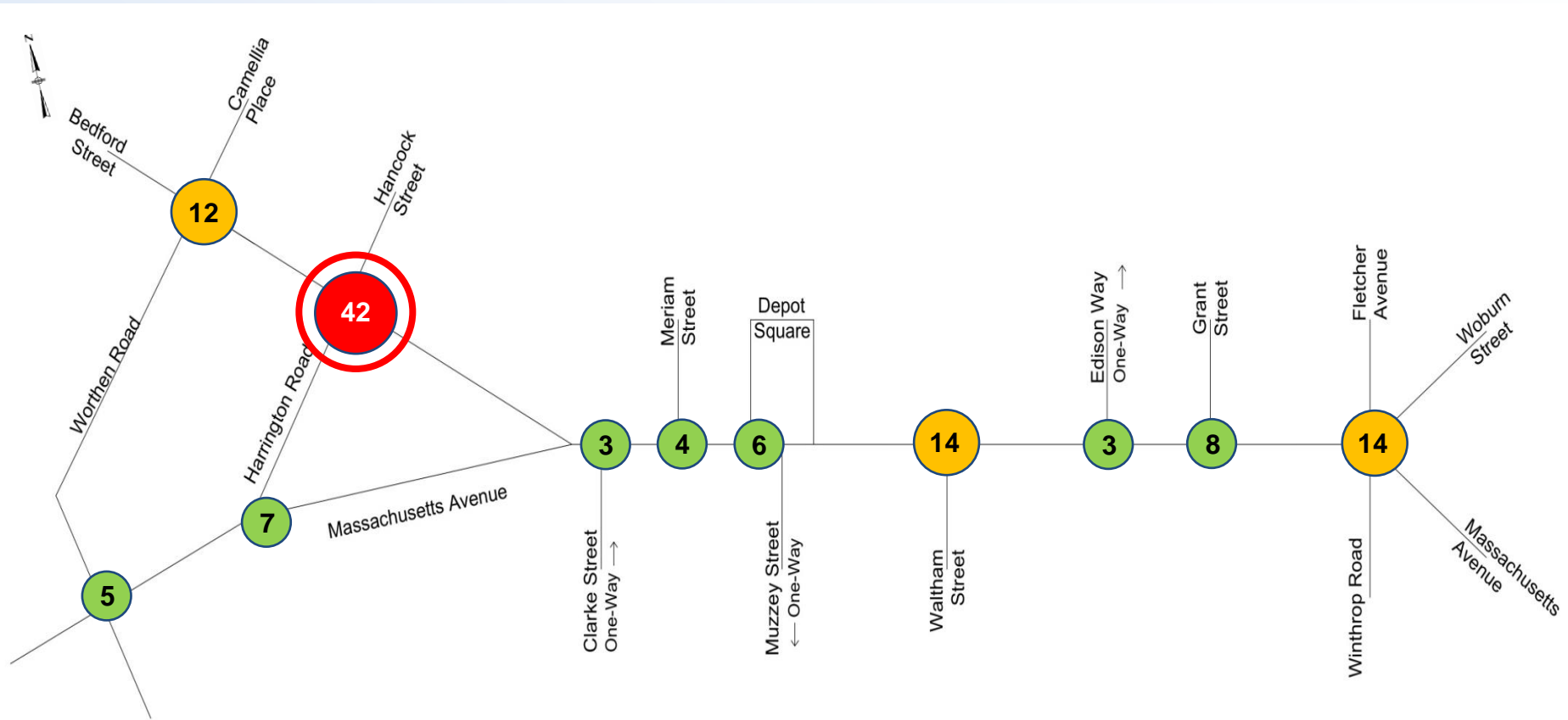
Existing Average Daily Traffic Volumes



Existing Peak AM and PM Turning Movement Volumes



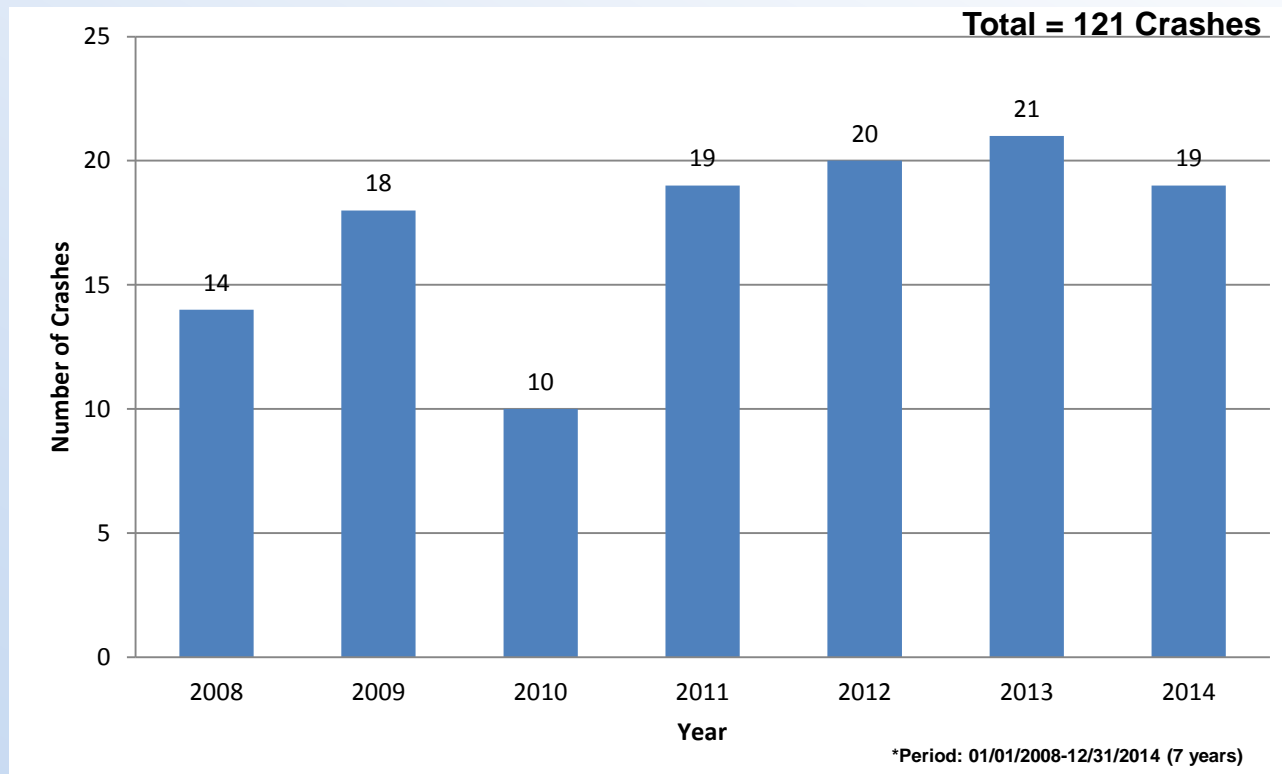
Intersection Crash History (2008-2010)



Crashes Within Entire Study Area = 196

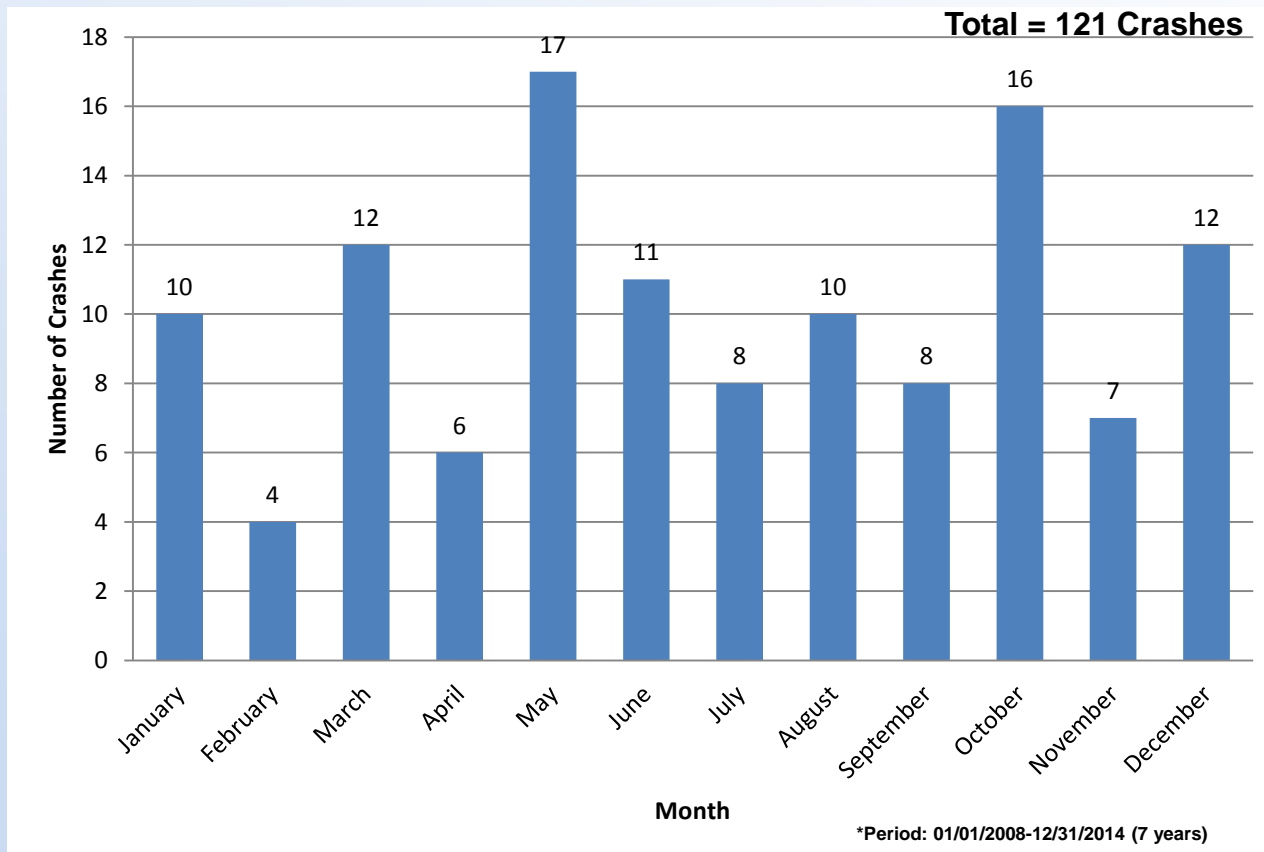
Number of Crashes by Year

Bedford Street @ Hancock Street & Harrington Road



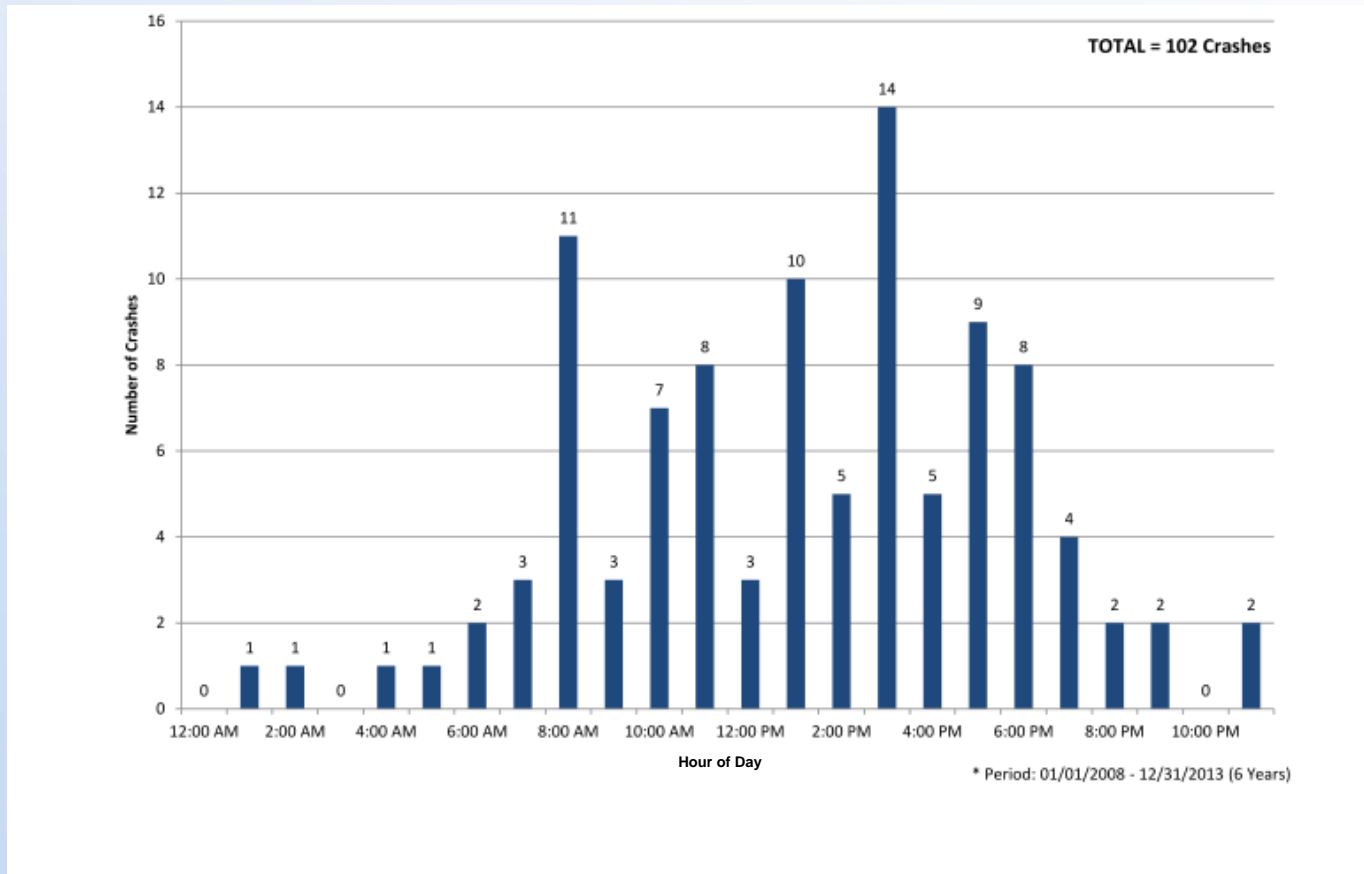
Number of Crashes by Month

Bedford Street @ Hancock Street & Harrington Road



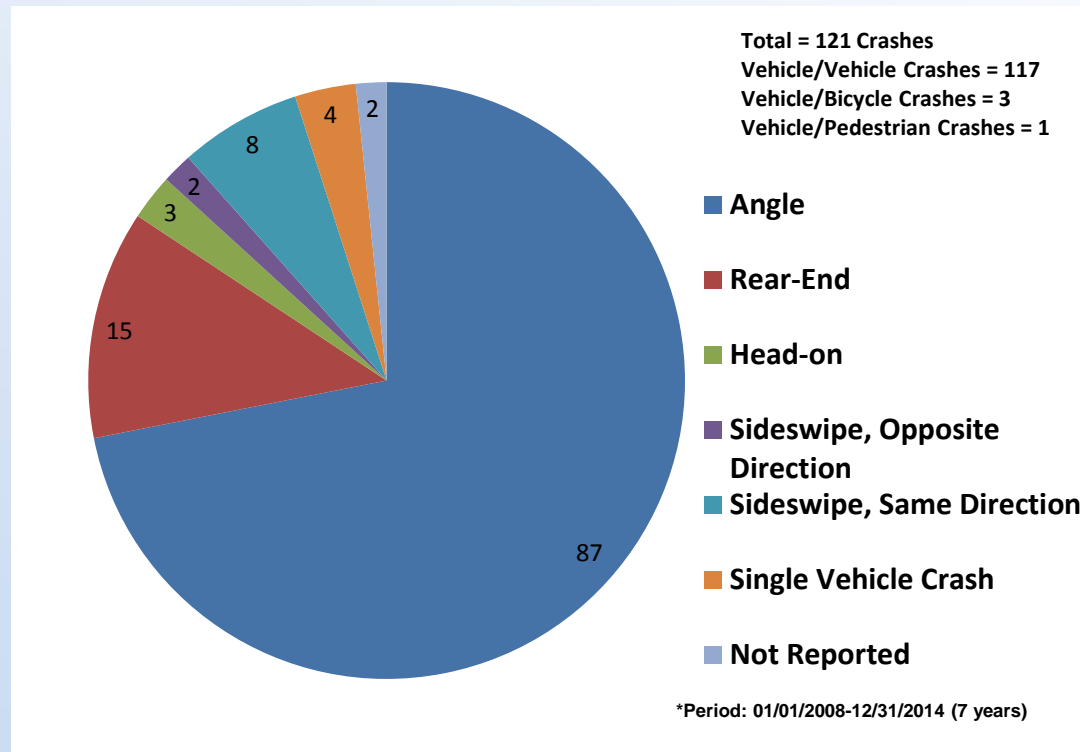
Number of Crashes by Hour of Day

Bedford Street @ Hancock Street & Harrington Road



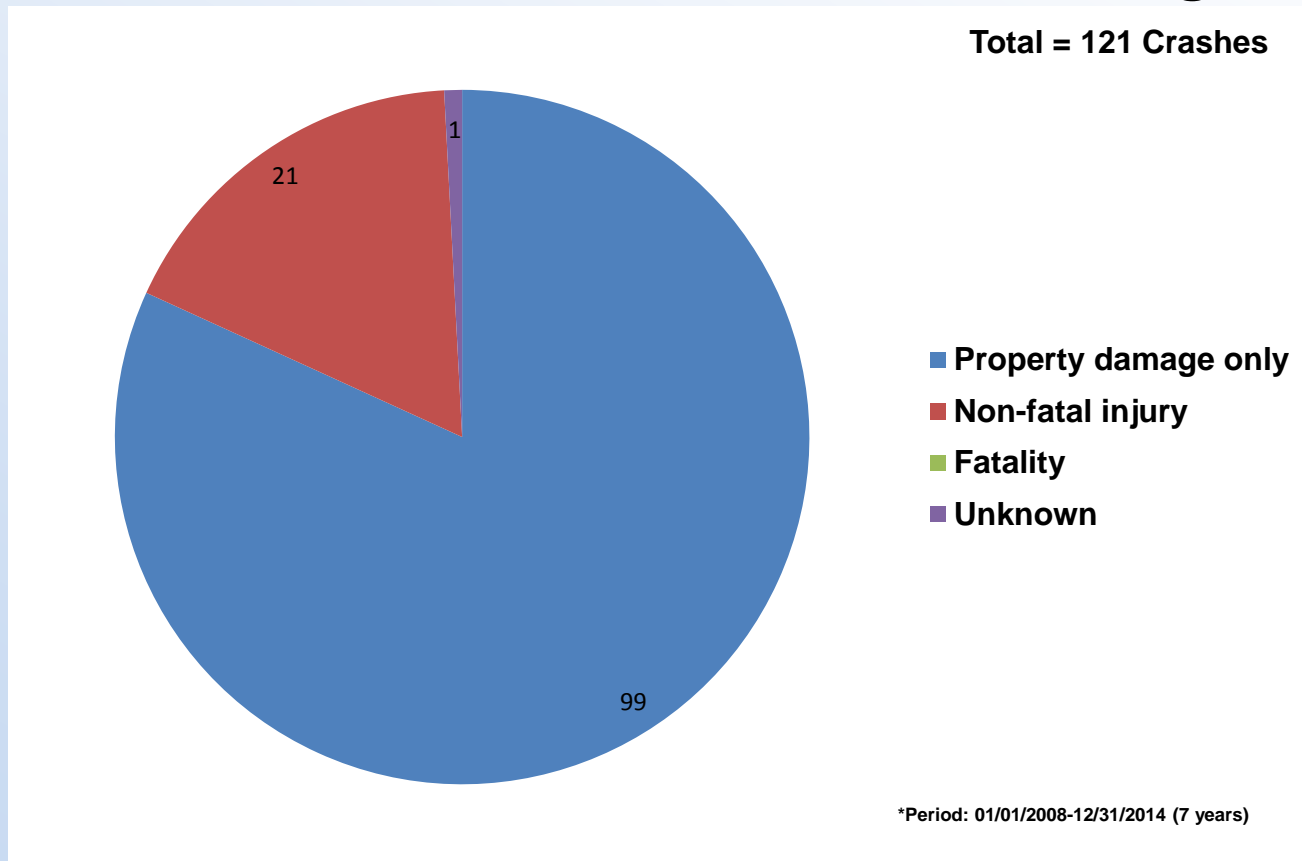
Crash Type

Bedford Street @ Hancock Street & Harrington Road



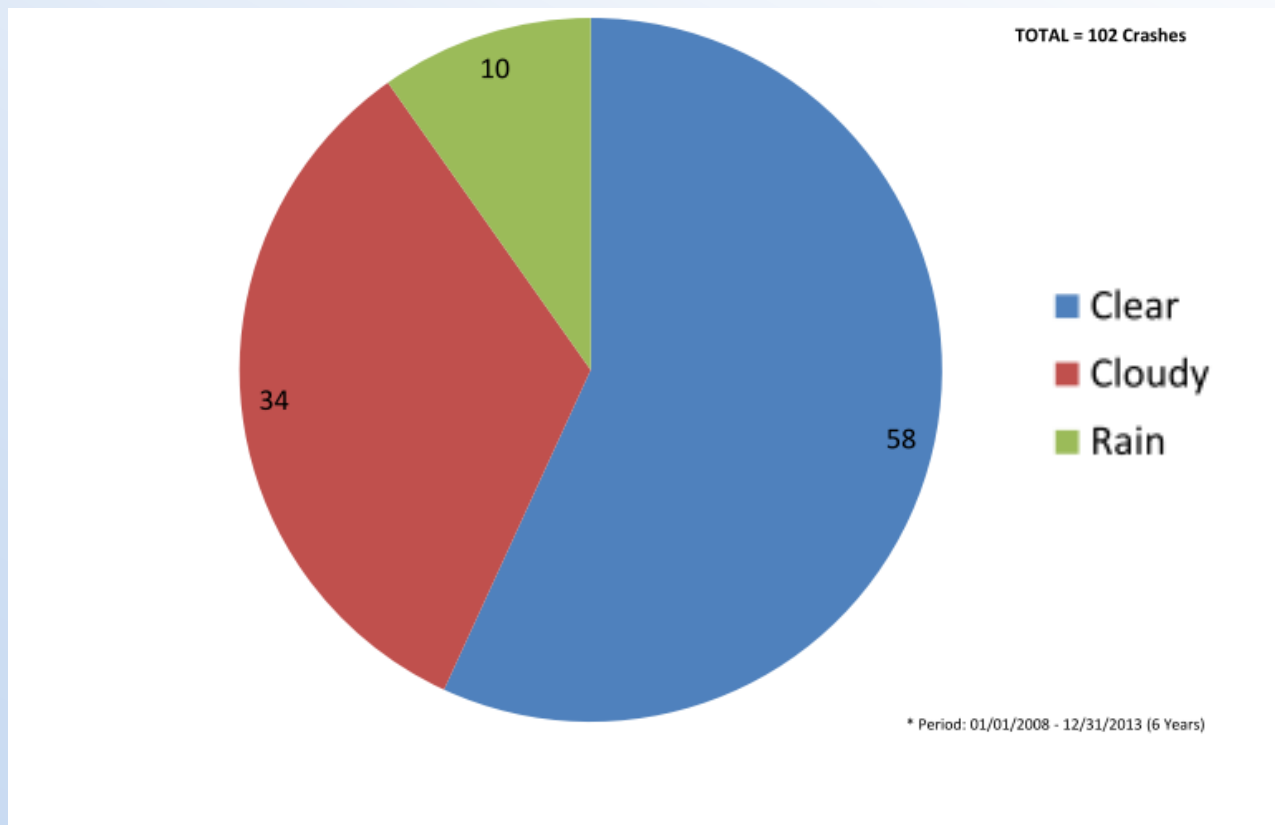
Crash Severity

Bedford Street @ Hancock Street & Harrington Road



Weather Conditions

Bedford Street @ Hancock Street & Harrington Road



Massachusetts Avenue / Woburn Street / Winthrop Road

Option 6A - Intersection With Single-lane Roundabout

